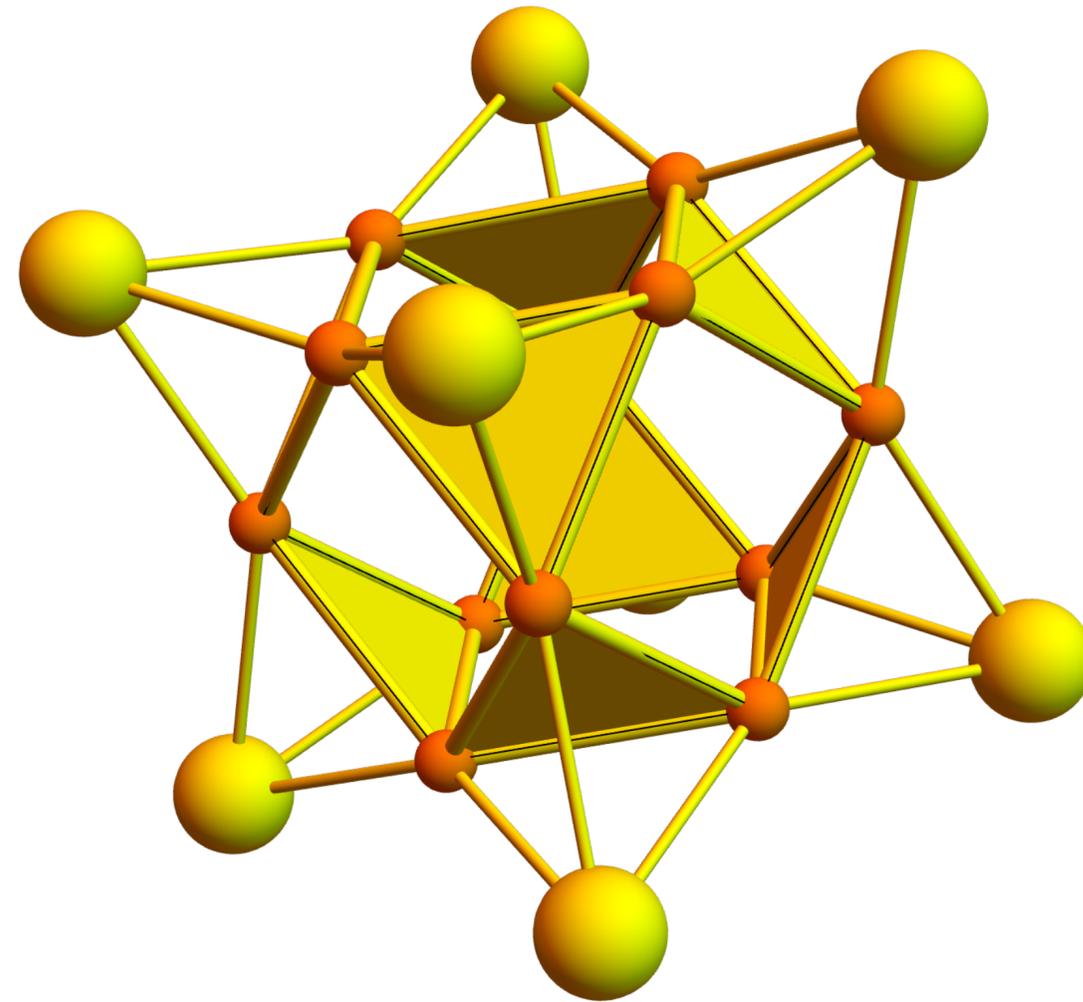


# Upperlevel Course Assistant Coordination Meeting



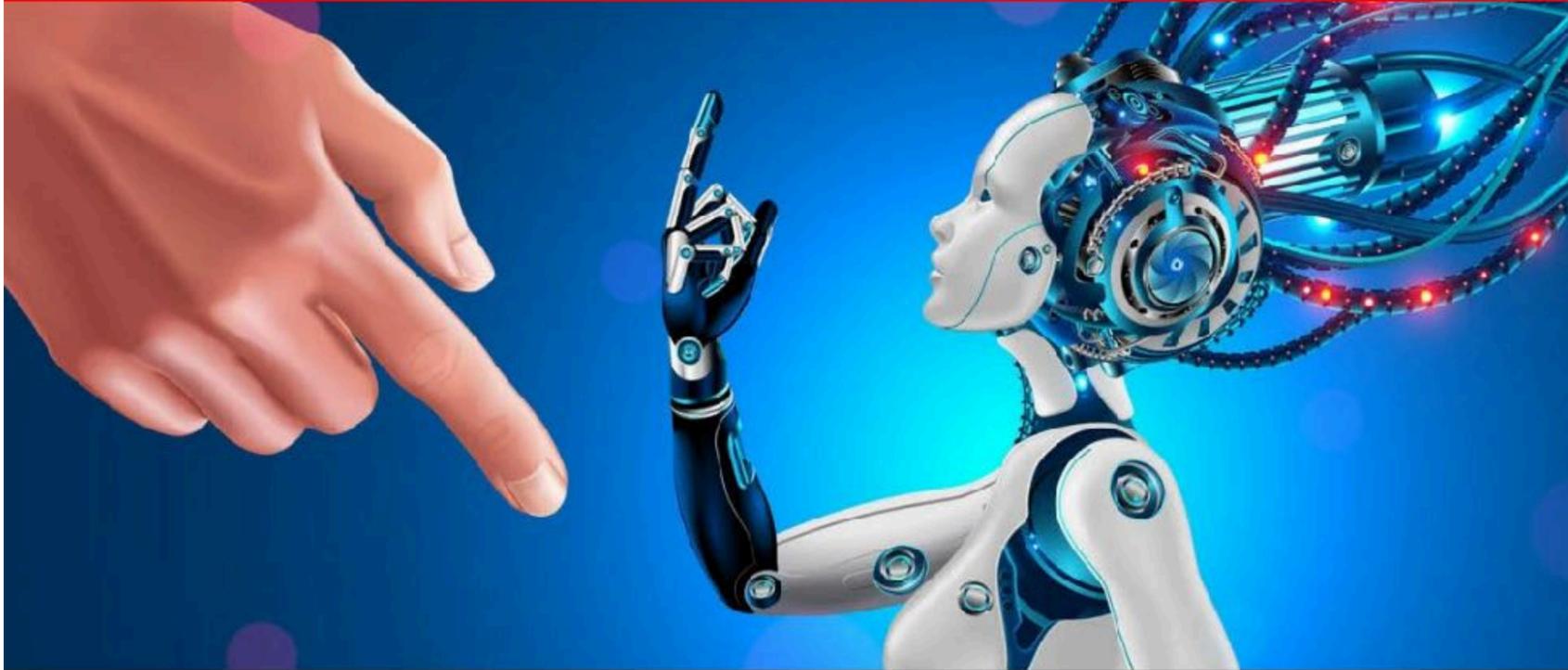
**Oliver Knill, January 22, 2023**

# **A remark about Grading**

# and AI ....

 SIGN IN / UP

The Register®



## OpenAI's ChatGPT is a morally corrupting influence

No principles or virtues, people accepting everything it says – this bot is perfect for political life

## colleagues, says watchdog boss

Surely there are quicker and more effective ways to end your co-w

## New IT boss decided to 'audit everything you guys are doing wrong'. Which went wrong

**ON CALL** Pet consultant took down the datacenter in attempt to find other people's errors

## Hey, online pharmacies: Quit spreading around everyone's data already

Google says don't worry, EFF warns of 'potentially horrific outcome'

# Chat GPT

Q: What is a scheme?

A: In mathematics, a scheme is a generalization of the concept of a variety, which is a topological space that is defined by a set of polynomial equations. A scheme is a topological space that is defined by a set of polynomial equations and inequations, as well as a set of additional "structure" on the space, such as the addition and multiplication operations. Schemes are used in algebraic geometry, which is the study of the geometric properties of solutions to polynomial equations.

# Chat GPT

How hard is the course Math 55 at Harvard?

Math 55 at Harvard is considered to be one of the most difficult undergraduate mathematics courses offered at the university.

Q: What do course assistants do?

Course assistants (CAs) are students who assist professors and instructors in the teaching of a course. Their duties can vary depending on the specific course and instructor, but generally, they help with the following tasks:

**Leading section:** CAs lead small-group discussions or review sessions for the students in the course. They help students understand the material and answer questions.

**Grading:** CAs may grade homework assignments, quizzes, and exams. They also provide feedback on student work to help them improve their understanding of the material.

**Office hours:** CAs hold office hours to help students with course-related questions or concerns.

**Tutoring:** CAs provide one-on-one tutoring to students who need extra help with the course material.

**Preparation:** CAs may help the instructor with preparing course materials, such as handouts, quizzes, and exams.

**Course management:** CAs may assist in the management of the course, such as managing the course website or managing the course gradebook.

In general, CAs play a critical role in helping students understand and succeed in a course. They help facilitate learning by answering questions, providing feedback and by providing additional resources, which are essential for student success.

# Chat GPT

# Chat GPT

Q:What is a module over a ring?

A: A module over a ring is a type of algebraic structure consisting of a set of elements with operations defined on them that satisfy certain axioms.

In mathematics, a module over a ring is a generalization of the concept of a vector space over a field. A module over a ring  $R$  is a set  $M$  on which two operations are defined: the addition of elements of  $M$  and the scalar multiplication of elements of  $R$  and  $M$  ( where the scalars are taken from the ring  $R$ ). The operations must satisfy a set of axioms which are similar to the axioms of a vector space, such as the associativity and distributivity of the operations.

# Chat GPT

Who is the most important mathematician at Harvard?

It is difficult to say who the most important mathematician at Harvard is as it depends on one's perspective and criteria for what constitutes "importance." Harvard has a long history of excellence in mathematics and has had many notable mathematicians throughout its history. Some of the most famous mathematicians who have worked at Harvard include Goro Shimura, Shing-Tung Yau, and Benedict Gross.

Currently, the faculty of Harvard includes many prominent mathematicians who are doing pioneering work in various areas of mathematics, like number theory, algebraic geometry, topology and more. It would be unfair to single out any one of them as the most important, as their contributions to the field are diverse and significant.

It is suggested that you look up on the Harvard math department website, to get a sense of the current research interests and expertise of the faculty members.

**Let's grade a  
homework submission  
by ChatGPT**

# Chat GPT

How many groups of order 6 are there?

There are five groups of order 6: the cyclic group of order 6, the Klein four-group, the dihedral group of order 6, the symmetric group of order 6, and the alternating group of order 6.

There are exactly 5 groups of order 6 up to isomorphism.

The cyclic group of order 6, denoted by  $C_6$ , is generated by a single element and its elements are powers of that generator.

The Klein four-group, denoted by  $V_4$ , is a group of order 4 with 2 generators and is also known as the commutative group of order 4.

The dihedral group of order 6, denoted by  $D_3$ , is a group that consists of symmetries of an equilateral triangle and contains a subgroup isomorphic to  $C_3$  and  $C_2$  (cyclic group of order 3 and 2 respectively)

The symmetric group of order 3, denoted by  $S_3$ , is a group of all bijections on a 3-element set, it has 3 generators.

The alternating group of order 3, denoted by  $A_3$ , is a group of even permutations on a 3-element set, it also has 3 generators.

It is worth noting that  $A_3$  is a normal subgroup of  $S_3$  and  $S_3/A_3$  is isomorphic to  $C_2$  (cyclic group of order 2).

Wrong!

Dumbass!  
you had that already!

Moron! Wrong!

This is the stupidest thing I have ever graded!

Be gentle

Be constructive

# Some Grading rules

Be fair

Give partial  
credit

**Better:**

# Chat GPT

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did you check  
the order?

correct except,  
that this is already covered

the alternating  
group has 3 elements

Good!

Prove the fundamental theorem of arithmetic

The fundamental theorem of arithmetic (FTA) states that every positive integer greater than 1 can be expressed as a unique product of prime numbers, where the primes are written in increasing order and the exponents are positive integers.

Proof:

Every prime number greater than 1 is a unique product of primes. This is true by definition of a prime number.

Let  $N$  be a positive integer greater than 1. We will prove that  $N$  can be expressed as a unique product of primes by induction.

Base Case:  $N = 2$ . 2 is a prime number, and it is the unique product of primes.

Inductive Step: Assume that the statement is true for all positive integers less than  $N$ . We will prove that it is also true for  $N$ .

If  $N$  is prime, then  $N$  is the unique product of primes, and the statement is true.

If  $N$  is not prime, then it has at least one divisor  $D$  that is not 1 or  $N$ . By the inductive hypothesis,  $D$  can be written as a unique product of primes. Since  $N = D * (N/D)$ , we can write  $N$  as a product of primes by multiplying  $D$  and  $N/D$ .

To prove uniqueness, suppose  $N$  can be written in two ways as a product of primes, say  $N = p_1^{e_1} * p_2^{e_2} * \dots * p_n^{e_n}$  and  $N = q_1^{f_1} * q_2^{f_2} * \dots * q_m^{f_m}$ .

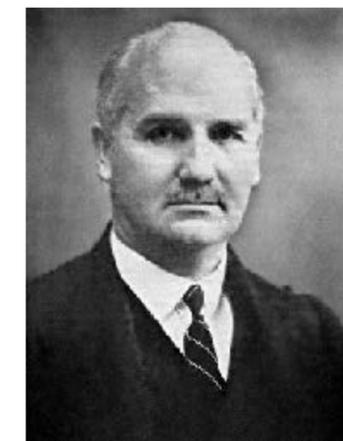
If we assume that  $p_i$  and  $q_j$  are different primes, then  $p_i^{e_i}$  can't be divided by  $q_j^{f_j}$ , and thus the two representations of  $N$  are different, that's a contradiction. So they must be the same primes, and the exponents should be the same as well, otherwise the product will be different.

Therefore,  $N$  can be expressed as a unique product of primes. This completes the proof of the fundamental theorem of arithmetic.

# Chat GPT

Existence is good  
For uniqueness,  
check your  
proof in a ring  
which is not a UFD  
like  $\mathbb{Q}[-\sqrt{5}]$   
where  
 $6 = 2 * 3 =$   
 $(1 + \sqrt{-5})(1 - \sqrt{-5})$

First correct proof was  
given by Lord Chervell  
1886-1957



# Chat GPT

The Pythagorean Theorem states that in a right triangle, the square of the length of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the lengths of the other two sides (the legs). More formally, if  $c$  is the length of the hypotenuse and  $a$  and  $b$  are the lengths of the legs, then the theorem can be stated as:

$$c^2 = a^2 + b^2$$

Proof:

Draw a right triangle with legs of length  $a$  and  $b$  and hypotenuse of length  $c$ .

Draw a square of side length  $c$  around the triangle, as shown in the figure.

Draw two squares of side lengths  $a$  and  $b$  inside the square of side length  $c$ , as shown in the figure.

The area of the square of side length  $c$  is  $c^2$ , the area of the square of side length  $a$  is  $a^2$ , and the area of the square of side length  $b$  is  $b^2$ .

The area of the square of side length  $c$  is equal to the sum of the areas of the squares of side lengths  $a$  and  $b$ , since the smaller squares are completely contained inside the larger square.

So,  $c^2 = a^2 + b^2$ .

This completes the proof of the Pythagorean theorem. It is worth noting that the theorem is not limited to right triangles only, it holds for any triangle with the same sides and hypotenuse and legs, and it is called the law of cosines.

You use the  
Theorem to prove it!

In general,  
the result is different  
and reads then as

$$c^2 = a^2 + b^2 - 2ab \cos(\alpha)$$
